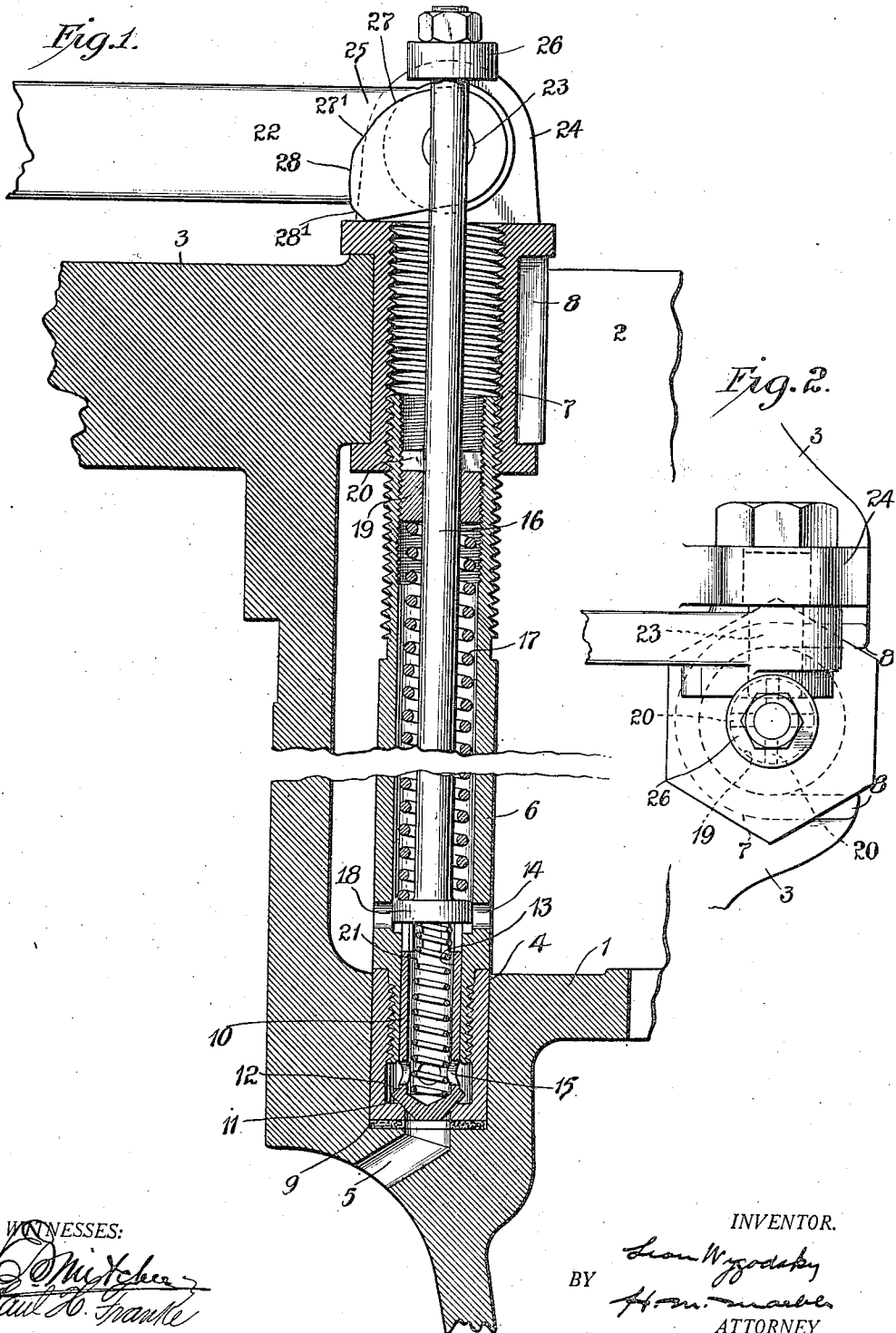


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RELIEF VALVE FOR INTERNAL COMBUSTION ENGINES.
APPLICATION FILED DEC. 26, 1916.

1,254,104.

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UNITED STATES PATENT OFFICE.

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RELIEF-VALVE FOR INTERNAL-COMBUSTION ENGINES.

1,254,104.

Specification of Letters Patent.

Patented Jan. 22, 1918.

Application filed December 26, 1916. Serial No. 138,989.

To all whom it may concern:

Be it known that I, LEON WYGODSKY, a citizen of the United States of America, and a resident of the city of Baltimore, Maryland, have invented a certain new and useful Relief-Valve for Internal-Combustion Engines, of which the following is a specification.

My invention relates to relief valves, particularly relief valves for internal combustion engines, and is intended to be used to relieve compression in the engine cylinder when starting or when, for any other reason, relief of compression is desired. The particular embodiment of my invention herein illustrated is particularly applicable to the engine of my application Serial No. 100,769, filed May 31, 1916; but in principle the valve is applicable to any internal combustion engine, with suitable modifications in details of construction, of course, to adapt it to the particular engine with which it is to be used.

The objects of my invention are to provide a simple relief valve by means of which, at one setting, the compression of the engine may be relieved altogether, so facilitating turning over of the engine when idle and when starting up; and by means of which, at another setting, the compression will be relieved when the engine is running slowly, but as the engine speed increases, the relief of compression will become partial only, until finally, at some predetermined speed, the relief of compression will practically cease; and to so construct the relief valve that with any setting excessive pressure will be relieved.

I will now proceed to describe my invention with reference to the accompanying drawings, and will then point out the novel features in claims. In said drawings:

Figure 1 shows a fragmentary vertical section of the cylinder head of the engine shown in my said application Serial No. 100,769, and shows my relief valve applied thereto, such relief valve being shown in central vertical section.

Fig. 2 is a detail top view illustrating the connection of the relief valve to the cylinder head.

In the drawings, 1 designates the said cylinder head, and 2 designates a recess formed in said head and normally open to the external air, 3 being a flange of the cylinder head which overlaps the top of the

engine cylinder and forms a joint therewith.

4 designates a valve cage fitting within a recess in the cylinder head, which recess communicates by a port 5 with the interior of the engine cylinder (such cylinder not shown). 6 designates a tubular member forming a continuation of the cage 4 and screw connected thereto at its lower end, while at its upper end said tube 6 is screw connected to a flanged sleeve 7 fitting into a fork 8 (Fig. 2) with which the cylinder head is provided. The top and bottom flanges of this sleeve 7 are machined to correspond to the depth of the fork 8, so that this sleeve 7 forms a secure abutment to receive the thrust incident to the forcing down of tube 6 and cage 4 against the packing 9 provided between the bottom of cage 4 and the bottom of the recess in the cylinder head in which such cage fits.

Within the cage 4 and its tubular extension 6 there is a hollow valve 10 having a seating portion 11 to coact with the bottom of the cage 4 and having another seating portion 12 to coact with the bottom of the tube 6. Above these seating portions of the valve, said valve is provided with a tubular guiding extension 13 working within said tube 6 as a guide; the upper portion of this guiding portion 13 being slotted to permit escape of gas from the interior of the valve through ports 14 provided in tube 6. The valve is provided with ports 15 which are open when the valve is seated against the bottom of the cage 4, or when the valve occupies an intermediate position, but which are closed when the valve is seated against the bottom of tube 6.

Within the tube 6 there is a valve rod 16, headed at its lower end so as to bear against the top of the valve 10. A spring 17 within tube 6 presses against the head 18 of the valve rod, and against a nut 19 in the upper portion of the tube 6; such nut having a screw thread engagement with the interior of tube 6, and having a central aperture through which the valve rod 16 passes freely; said nut being slotted at 20 to permit engagement of the nut by a suitable key, for turning it in or out, and so for adjusting the pressure of the spring 17. The valve 10 has within it a light spring 21 tending to hold that valve seated against the bottom of the valve cage 4.

A hand lever 22, pivoted at 23, to a lug 24,

formed on the cylinder head, is provided with a cam 25 adapted to work against a collar or shoulder 26 located near the top of the valve rod 16. The face of this cam 25 has two lift portions 27 and 28 with corresponding dwells 27' and 28'. The action of this cam will be explained later.

The action of the valve is as follows:

Normally, valve 10 is held seated, as shown in Fig. 1, by the spring 17 pressing the valve rod 16 against the top of said valve 10; this spring being of stiffness sufficient to hold the valve 10 seated against the maximum permissible pressures of the engine; though in the event of development of excessive pressure in the engine cylinder, valve 10 will lift against the pressure of spring 17 sufficient to permit escape through its ports 12 and the ports 13 in the sides of cylinder 6, thus acting as a safety valve.

To relieve compression of the engine altogether, the cam 25 is moved, by lever 22, until its dwell 27' is underneath the collar 26. In that position, valve rod 16 is lifted sufficiently to permit valve 10 to rise, with development of very slight compression in the engine cylinder, and to permit escape from the engine cylinder through port 5, ports 15 of the valve and ports 14 of tube 6; the valve rod 16 being not then lifted so high, as to permit the valve 10 to seat against the bottom of tube 6 and so to shut off escape from the engine cylinder. If the lever 22 be moved farther so as to bring the dwell 28' of the valve underneath the shoulder 26, then valve rod 16 will be lifted so high that with each development of material pressure in the engine cylinder the valve 10 may seat against the bottom of tube 6, so closing its ports 15; but such seating will depend upon the speed of the engine. If the speed of the engine be low, valve 10 will not be lifted sufficiently by the compression to seat against the bottom of the tube 6 and so cut off out-flow from the engine cylinder; but as the speed of the engine increases a point will soon be reached at which after more or less relief of compression, during each compression stroke or ensuing working stroke, the valve 10 will shut off escape of gases after some relief of pressure has occurred; and as the speed of the engine still increases, the closure of relief by valve 10 will occur earlier and earlier, until by the time the engine has reached nearly its normal speed, the valve 10 will seat against the bottom of the tube 6, and so will cut off relief of pressure, very early in the compression stroke of the engine, and before ignition. In this way the valve 10 acts as an automatic speed-controlled relief valve which relieves compression automatically when the speed of the engine is low, reduces the relief of the compression in substantial proportion to the increase of engine speed, and finally practi-

cally shuts off relief of compression altogether. Of course, after the engine is in full operation at normal speed, lever 22 will be thrown down into the normal position shown in Fig. 1; after which the valve 10 will not open at all, except in case of development of some very unusual pressure in the engine cylinder.

The critical speed at which the valve 10 reaches its upper seat depends entirely upon the tension of the light spring 21. The lighter the tension of the spring the sooner such an effect will be accomplished and the higher will be the compression pressure obtained in the engine cylinder.

It will be noted that as the valve 10 nears its upper seat, the ports 15 of the valve are more or less completely covered by the walls of the tube 6 so that considerable throttling of the escaping gases occurs before such escape is cut off by the seating of the valve against the end of the tube 6. This is a decided advantage, as it helps materially in the automatic control of the compression relief.

What I claim is:

1. A compression relief valve for engines comprising a vibrating ported double beat valve arranged to be vibrated by successive compression impulses of the engine and arranged to shut off compression relief when in either extreme position, but to permit compression relief when in intermediate positions, and means acting to throttle escape through the port of such valve when said valve is near one of such extreme positions.

2. A compression relief valve for engines comprising a vibrating ported double beat valve arranged to be vibrated by successive compression impulses of the engine, and having a relief port through which relief may occur in intermediate positions of said valve, but through which flow is closed when said valve is in either of its extreme positions, and means acting to throttle escape through the port of such valve when said valve is near one of such extreme positions.

3. A compression relief valve for engines comprising a ported double beat valve arranged to be vibrated by successive impulses of the engine, and having a relief port through which relief may occur in intermediate positions of said valve, but through which flow is closed when said member is in either of its extreme positions, means acting to throttle escape through the port of such valve when said valve is near one of such extreme positions, and elastic pressure means tending to hold said valve in one of its extreme positions, but arranged to permit such valve to move to or toward its other closed position under the influence of compression pressure.

4. A compression relief valve for engines, comprising a valve cage seated in a suitable

chamber of the engine, which chamber is connected to the engine cylinder, said cage having front and rear valve seats, and a hollow ported vibrating valve within said cage arranged to be vibrated by successive compression impulses of the engine and to seat against one or the other of such valve seats in its vibration, and in intermediate positions to permit compression relief through said cage, said cage arranged to throttle escape through the port of said valve when that valve is near its rear seat.

5. A compression relief valve for engines, comprising a valve cage seated in a suitable chamber of the engine, which chamber is connected to the engine cylinder, said cage having front and rear valve seats, and a hollow ported vibrating valve within said cage arranged to be vibrated by successive compression impulses of the engine and to seat against one or the other of such valve seats in its vibration, and in intermediate positions to permit compression relief through said cage, said cage arranged to throttle escape through the port of said valve when that valve is near its rear seat, and elastic pressure means tending to hold said valve in one of its extreme positions.

6. A compression relief valve for engines, comprising a valve cage seated within a suitable chamber of the engine, which chamber is connected to the engine cylinder, and a tubular double beat valve within such cage, said cage having two seats against which the valve may seat alternately when vibrated, said valve arranged to be vibrated by successive compression impulses of the engine, and having a port through which relief may occur when such valve is in intermediate positions, but flow through which is shut off when said valve is seated against either of said seats, said cage arranged to throttle escape through the port of said valve when that valve is near its rear seat.

7. A compression relief valve for engines, comprising a valve cage seated within a suitable chamber of the engine, which chamber is connected to the engine cylinder, and a tubular double beat valve within such cage, said cage having two seats against which the valve may seat alternately when vibrated, said valve arranged to be vibrated by successive compression impulses of the engine, and having a port through which relief may occur when such valve is in intermediate positions, but flow through which is shut off when said valve is seated against either of said seats, said cage arranged to throttle escape through the port of said valve when that valve is near its rear seat, and elastic pressure means tending to hold said valve against one of its seats.

8. A relief valve for engines comprising

a vibrating ported double beat valve arranged to be vibrated by excessive compression impulses of the engine, but having a relief port through which relief may occur in intermediate positions of such valve, but through which flow is closed when said valve is in either of its extreme positions, and adjusting means for said valve comprising a loading spring normally holding said valve closed, and means for freeing said valve of the load of said spring.

9. A relief valve for engines comprising a vibrating ported double beat valve arranged to be vibrated by excessive compression impulses of the engine, but having a relief port through which relief may occur in intermediate positions of such valve, but through which flow is closed when said valve is in either of its extreme positions, and adjusting means for said valve comprising a loading spring normally holding said valve closed, and means for freeing said valve, completely or partially as desired, of the load of said spring.

10. The combination with an engine cylinder having a compression relief port, of a valve cage seated in such relief port and having itself a port communicating with such relief port, said cage having a relief passage communicating with the relief port of the cage and having two opposed valve seats, a relief valve within such cage adapted to seat upon such seats alternately, a loading spring for said valve, and a cam having various lift portions whereby said valve may be freed, completely or partially as desired, of the load of said spring.

11. The combination with an engine cylinder having a relief port, a valve cage seated in said port and having itself a port communicating with said relief port, said valve cage having a relief passage forming a continuation of the said port of said cage and having two valve seats, a valve within said cage adapted to seat against one or the other of said valve seats alternately, a loading spring for said valve and a valve rod therefor engaging the inner end of said spring and located within and projecting out of such cage and adapted to be drawn out and thereby to relieve the valve, completely or partially, of the load of said spring, and a pivoted lever provided with a cam adapted to engage such valve rod and thereby to draw out said valve rod to various distances.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LEON WYGODSKY.

Witnesses:

H. M. MARBLE,
PAUL H. FRANKE.